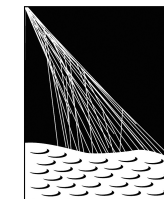
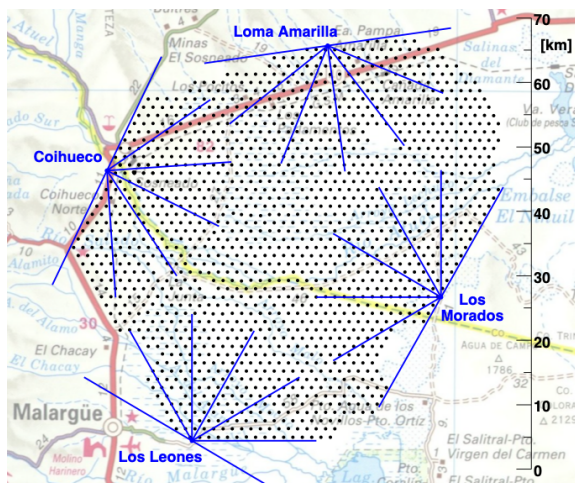


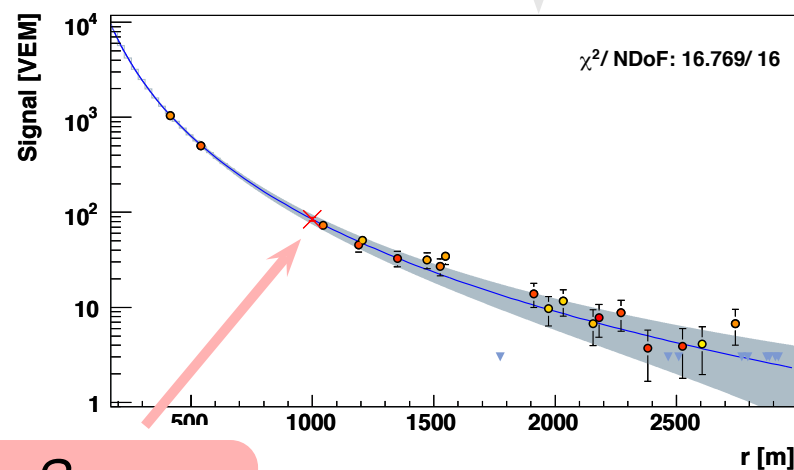
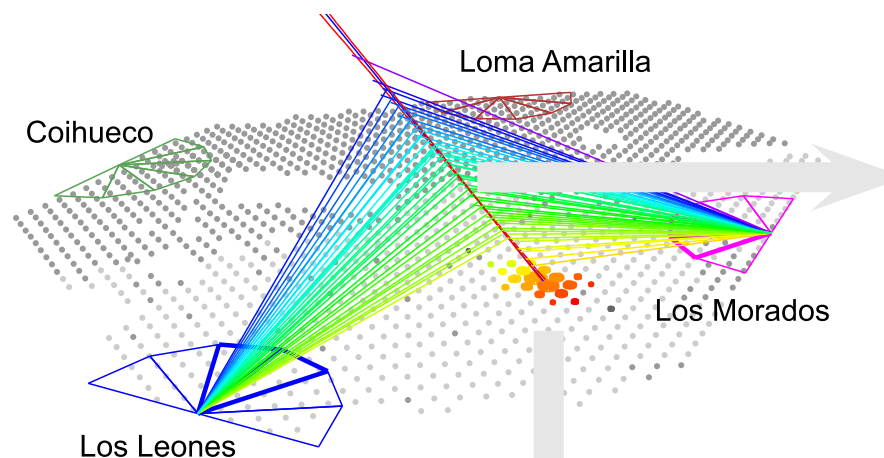
The Pierre Auger Observatory



PIERRE
AUGER
OBSERVATORY

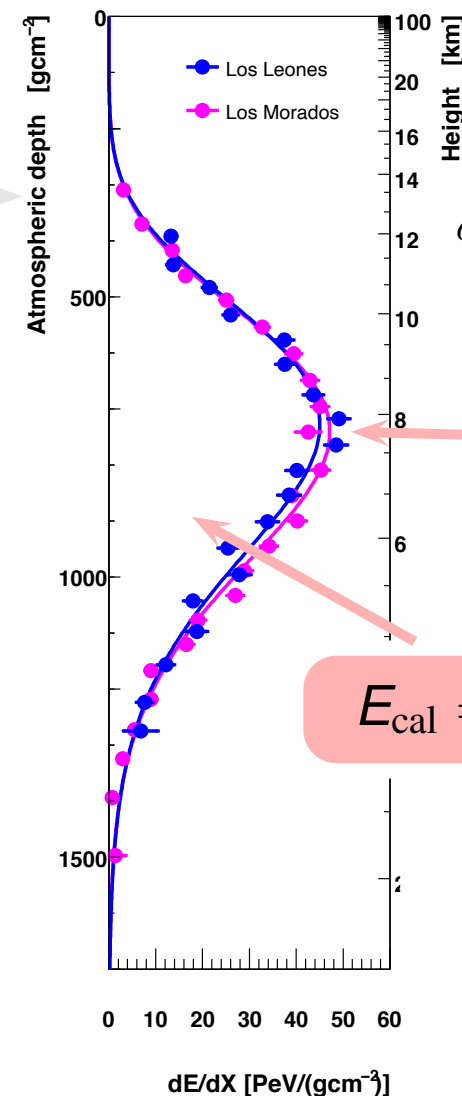


- 1660 water Cherenkov detector stations, spread out over 3000 km² (Surface Detector, **SD**)
- 27 fluorescence telescopes (Fluorescence Detector, **FD**)
- Taking data since 2004, currently undergoing a major detector upgrade (**AugerPrime**)
 - Plastic scintillators on top of each SD station
 - Radio upgrade
 - Main goal: enhance **composition sensitivity**



S_{1000}

$$E_{\text{surface}} = f(S_{1000}, \theta)$$



$$\sigma_{X_{\text{max}}} \leq 20 \text{ g/cm}^2$$

$$\Delta_{\text{sys}} \leq 10 \text{ g/cm}^2$$

X_{max}

$$E_{\text{cal}} = \int \frac{dE}{dX} dX$$

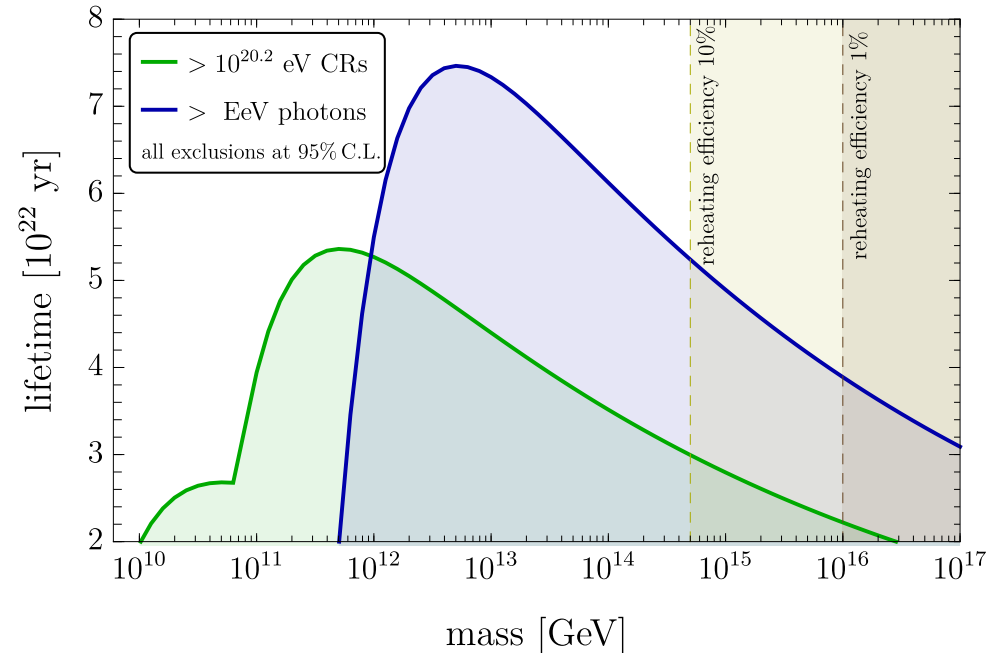
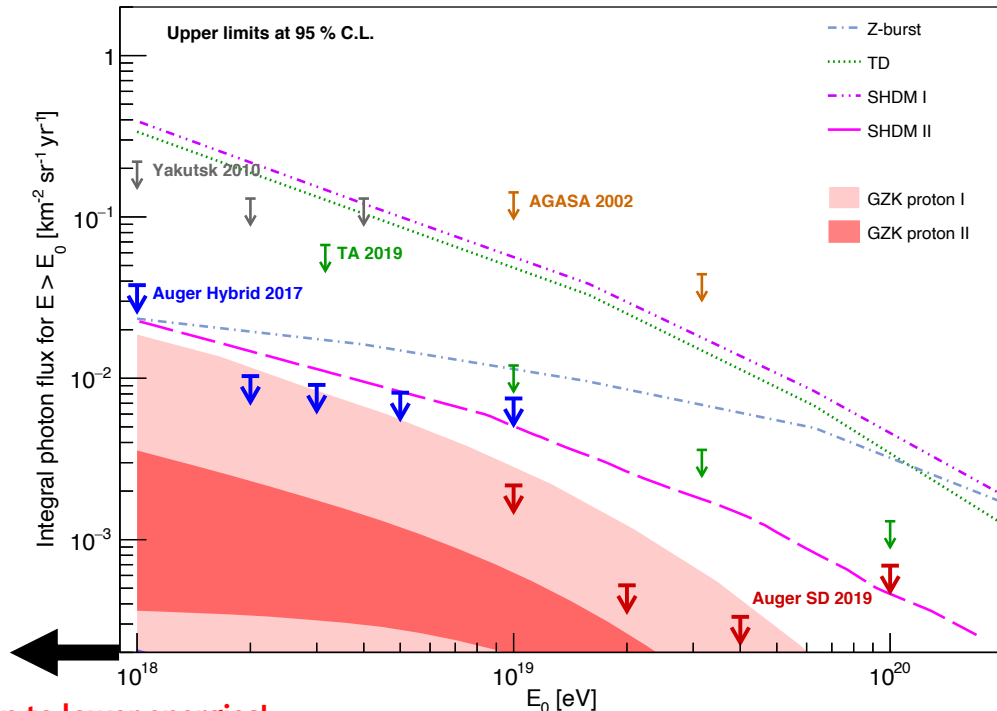
$$\sigma_E/E \sim 8\%$$

$$\Delta_{\text{sys}} \approx 15\%$$

Ultra-high-energy (UHE) photons at Auger: (some) scientific goals



- Pose constraints on the **origin of UHE cosmic rays** and the **properties of their sources** in conventional *bottom-up* models: expected flux of **cosmogenic (GZK) photons** depends on e.g. primary composition and source properties
- Constrain **exotic top-down models** for the origin of UHECRs: **Super-heavy dark matter (SHDM)** provides a link between cosmology and astroparticle physics, relating the expected flux of UHE photons to the lifetime-and-mass parameter space of SHDM particles
- Test **new-physics scenarios**, e.g. Lorentz invariance violation



Auger Letters of Interest related to UHE photons:
SNOWMASS21-CF7_CF3-NF4_NF0_Jaime_Alvarez-Muniz-140
SNOWMASS21-CF1_CF7-203